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J. C. VAN DER MEULEN, Rotterdam

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In a world where mechanisation and automation have led to a devaluation of skilled manual work, and where only certain press and publicity media doubt the superiority of the mind, the following operating-theatre dialogue is refreshing:

Surgeon: The surgeon's hands are his finest instruments.

Physician: Anyway, he can't lose them in the abdomen.

The surgeon praises his hands and the work they enable him to do. The physician expresses his doubts about the reasoning powers that are responsible for this work. Such a dialogue invites discussion on the subject of the hand, and also provides me with an opportunity for making a few remarks about the relation between surgeon and physician.

As you will all know, it was usual until recently to make a distinction between physicians and surgeons, based on the supposition that the two were birds of a different plumage.

The physicians were supposed to be heirs of the age-old venerable school of Aesculapios, while the surgeons were descended from the less respectable ranks of the barbers and lithotomists. However, history teaches us that the link between physician and surgeon is closer than is often thought.

When Thetis wanted to make her son Achilles immortal by laying him in the glowing embers of the fire, she was surprised by Peleus, her husband; Thetis, startled, dropped the child and ran away, never to return. Peleus took up his son, whose right heel had been burnt, and carried him to the centaur Cheiron, whose hands were said to have the gift of healing. Cheiron (the name is derived from the Greek word for hand) replaced Achilles' heel-bone by that of a dead giant, thus performing the second bone transplant in history.

The healing gifts and the fame of Cheiron, the surgeon, were so great that when Apollo had saved his son Asklepios from the womb of his paramour, who was to be burned at the stake for adultery, he brought the child to Cheiron and asked him to bring up the boy. Cheiron taught Apollo's son the art of healing, thus laying the foundation for the school of Asklepios.

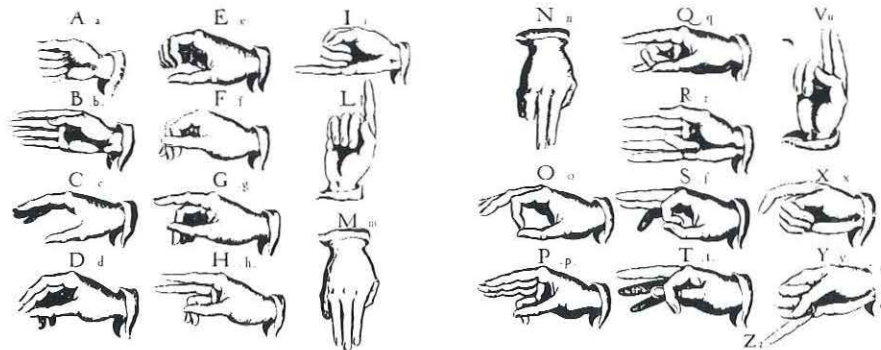


Fig. 1. Alphabet for the deaf-mute.

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THE HEALTHY HAND

Car les mains ont leur caractères, C'est tout un monde en mouvement.
Paul Verlaine.

The hand has long been a favourite topic for philosophers. Aristotle, Sophocles and Galen state in their writings that man has hands because he is the most intelligent of all creatures, and thanks to these hands he is the best equipped to perform the task nature has given him. They regard the superiority of the hand as a gift bestowed upon mankind and not as something which has evolved from constant use. Man is the king of nature despite himself. Un roi de droit divin.

Diametrically opposed to this we have the view of the followers of Asklepios, who assume that the human body was made without any purpose, and that the form of the hand is in the last resort determined by its function. This line of thought carries in itself the seeds of the work of Lamarck, Darwin and Haeckel, each of whom contributed in his own way to our knowledge of evolution. The history of the hand starts at the moment that the first man stands upright and steps out from the jungle into the open plain. There were no hands before this time. As Heidegger says, the ape has grasping organs, not hands. A great gulf separates the hand from a grasping organ. Only a being that talks or thinks can have a hand.

However, man was not given his hands suddenly, and initially he was not conscious of possessing them. Indeed, at that time he was really single-handed; his two hands functioned as one, and he did not know the difference between left and right. The hand did not become independent until man became conscious of the space about him.

And with his hand, man himself became independent. Gideon used this knowledge when he was choosing his band of three hundred men to defeat the mighty hosts of Midian. He watched his men while they were drinking from a brook, tired after a march, and saw that some drank like oxen, on hands and knees, while other lapped the water with their hands. He chose the most independent, the most civilised of them for his dangerous mission—the ones that used their hands.

When the inhabitants of the Nile valley, the ancient Egyptians, faced southwards, the Nile divided their world in two. The sun rises on the left, in the east, delivering its life-giving heat, and sets on the right, in the west, taking its heat back again. In their language, left became synonymous with east and right with west. Man had found his bearings, had become two-handed; distinguishing him even further from animals.

In animals and in man the left half of the body is controlled by the right half of the brain and vice versa. Information is transmitted between the two hemispheres via a bridge. As long as this bridge is intact the one half of the brain can inform the other half of what it has learnt. A split brain animal therefore behaves much as though it had two brains. The situation is somewhat different with man. In man there is a relation between hemispheric dominance (specialisation) and hand preference. Findings in human split brain patients were summarised by Brinkman as follows: "A lack of interhemispheric transfer of visual and tactile stimuli is present in man like it is in the split-brain animal; moreover, a number of specific deficits exists in man because of the lateralisation of linguistic ability in one hemisphere and spatial ability in the other. The left, verbal brain appears to be superior and dominant for verbal communication, linguistic and numerical processing, sequential and analytical thinking, for conceptual recording and for directing motor capacities in general. The right hemi-

sphere is found to be superior for perceptual recognition of faces, of nondescript figures as whole patterns and for dealing with spatial and part-whole relationships, for non-verbal thinking and direct perceptual transformation and for skilled use of the left hand in drawing and use of objects." A split-brain right-handed man cannot write anything at all meaningful with his left hand. He cannot carry out verbal commands with his left hand. He cannot name an object by touching it with his left hand. Without this tactile ability, an object would never have become an object, and without the ability to grasp an object that object would never have become a tool. Thanks to these two unique qualities, man became a toolmaker.

Tools are copies, projections of hands, which led the Greek to use the word organon (organ) for the copy of a part of the body as well as for the part itself. Thanks to this organic projection, the unconscious becomes conscious. Man doubtless owes his awakening from the cosmic sleep to the hand and what it did. The hand made perception possible. Conceptual thinking arose from the independent working together of the two hands. This rise into consciousness, which led from prehension to comprehension and from weighing to weighing up, manifested itself in two ways: on the individual plane by a poly instrumental activity and on the social plane by common use of tools. Individual activity was growing into business. Homo faber and with him the need for communication, was born. Once again the hand played an important role in the realisation of this communication. Apart from its ability to grasp and handle objects, the hand can also give the formless form. Just like the intellect, the hand can reproduce the form or the essence of things. The gesture thus became the intermediary between what was absent and what was present. Sign language became the means of communication (Fig. 1) par excellence—but not for ever.

Ultimately a new dimension was to be added to the possibilities of communication by the development of speech. The sounds which surround man were reproduced, and gestures turned into sounds—which initially only accompanied the gestures but finally grew into a language of their own. It is no accident that

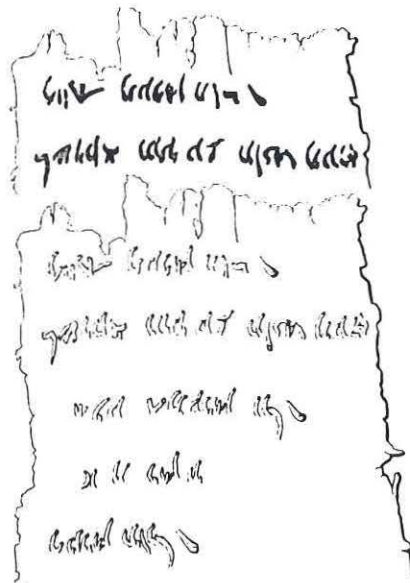


Fig. 2. Phoenician papyrus: From J. Barrois, *Dactylogie et langue primitif*, Paris, 1850.

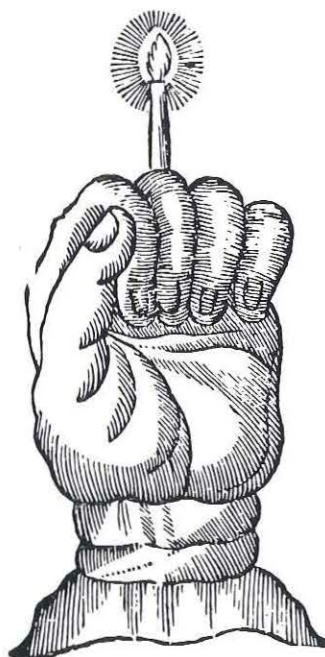


Fig. 3. Hand of Glory (main de gloire) petit-Albert, Cologne, 1722.

man's speech centre is just next to his manual centre—in the left hemisphere of the brain for the right-handed people, and in the right hemisphere for left-handed people. Also and not surprisingly there are close parallels between thinking with language and thinking with the hand. It is the experience of our hands which determined the richness of our language. Arabs have only one word for cold, ice or snow. Eskimos have many. A good sensomotoric relation between hand and space is essential not only for the richness of our language, but also for the forming of each individual's vocabulary. Children in whom this relation is disturbed often have learning and writing problems. Despite the development of language, man has retained the ability to "speak" in sign language; for the deaf and dumb, this forms a very important means of communication. However, the highest degree of perfection in this form of communication is achieved by the hand-gestures in the ritual of the Buddhist priests, and in Hindu dances (the "Mudras"). Understood only by initiates this secret language is graced by quiet simplicity and a rich content.

When man wishes to store the knowledge he has gained, it is again the hand which records sign language in the form of drawings, and spoken words as writing. The fact that the word "a" in old Egyptian means hand, and is represented by the same hieroglyphic as "I" illustrates how it played a vital part in the very beginning of the written language. Its plasticity forms the basis of the alphabet (Fig. 2). It enables us to paint and sculpt, mould clay and make music. It gives the formless form and makes the absent present. This ability is one of the factors that has led to the development of man from homo faber to homo sapiens, and from homo homonatus (man made man) to homo hominans (man making man). He holds his future in his own hand—a future as a social giant in a godless, marxist world, or in the world of Teilhard de Chardin with its synthesis of religion and science.

However, the theory of evolution is not the only branch of science which uses the study of the hand (among other things) to gain an insight into the secrets of the past and the origin of man. The science (or art) of palmistry (chiromancy) is also based on an intensive study of the hand.

Whilst the study of the hand in evolutionary theory is aimed at obtaining data on the origin of the species which can be extrapolated to a vision of the future, the study of chiromancy is concerned with the origin of the individual. The chiromancer sees the hand as the meeting-place of man and cosmos; by study of the hand he hopes to gain an insight into man's constitution and character, and tell our past and future fortune.

The chirologist is more modest. He knows his own limitations, and hesitates to draw conclusions which are not backed up by objective evidence. The relation between hand and body was early on laid down by Hippocrates (digitus hippocraticus or clubbed finger) and later supported by the developing science of dermatoglyphics. And then again the relation between the hand and the spirit was studied by Carl Gustav Carus, who classified human character structures with reference to the different hand types about seventy-five years before the better known investigations of Kretschmer.

Finally the graphologist claims that man's character is always revealed in his handwriting. His analyses are often strikingly accurate, and are finding increasing use nowadays. In view of all the above considerations, it is understandable that powers have been ascribed to the hand throughout the ages, which it does not possess at all. There are numerous examples of this: the hand of God and the blessing of the priest; the hand of righteousness and the royal sceptre; healing and the driving out of evil spirits by the laying-on of hands; hands as talismans, and the hand of a hanged felon (hand of glory) which when cut from the corpse on the gallows and prepared in the proper way was supposed to make a thief invisible on his nightly jaunts (Fig. 3).



Fig. 4. Gabrielle d'Estrées et la Duchesse de Villars. School of Fontaine bleu, End XIVE century.

Not only the hand as a whole but its component parts were invested with a special significance. The thumb (*antichair*), big and strong, has always been a symbol of might and fertility (phallic symbol). The region of the cerebral cortex controlling the thumb is as big as that of the rest of the hand put together. The middle finger was the healing finger (*digitus medicus*), sometimes less respectfully called the *digitus impudicus*. The ring finger carries the symbol of fidelity, the ring with the stones which according to legend are associated with Prometheus unbound: when Zeus was moved by pity to free Prometheus from the rock, he ordered him to wear a ring containing stones, to perpetuate in some small measure his bondage to the rock. It is quite obvious why the middle finger is called the middle finger, and the ring finger the ring finger: the former is in the middle and the latter often carries a ring. However, it seems to be a trick of fate that the index finger (the "pointer") got his name. Since, after all, this finger does not restrict itself to indicating apart from pointing (Fig. 4). Nor do I understand why professors of anatomy who have to discuss the independent character of the little finger and hence the function of the *musculus extensor digiti quinti* always give the example of the elegant gesture of the lady drinking a cup of tea, when there are so many other examples to choose from (Fig. 5).

Our ancestors also gave the difference between left and right a magic significance. Among Pharaoh's people, the left hand was impure, the right pure. Even today, the word left has a sinister ring in the ears of many. Awkwardness is still often referred to as *gaucheness*, and manual skill as *dexterity*. The conflict between left and right has a long history; let us hope that its future will be just as long. Unless of course man is able to overcome the differences between the two, not by suppressing one of the opponents, but by a process of synthesis.

Sign of such an evolution in which left or right no longer play a predominant part and the boundaries of space are vanishing can be found in the work of Esser, a Dutch artist, who wrote with one hand and painted with the other, who in fact was really ambidextrous (Fig. 6).

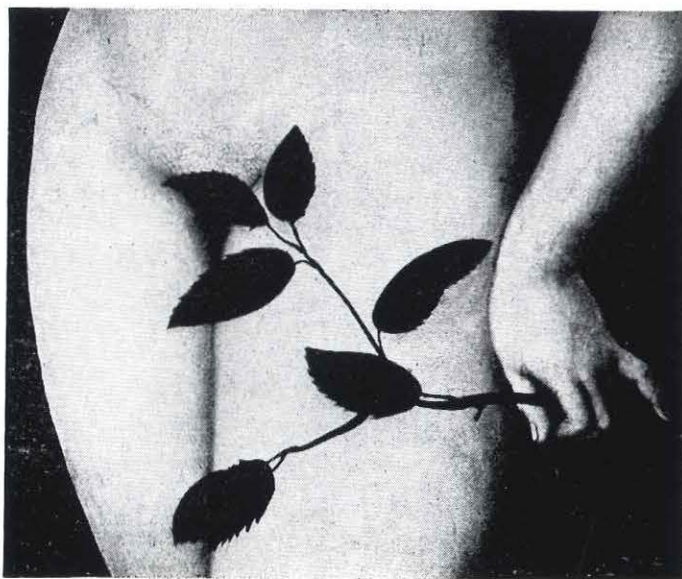


Fig. 5. Eve, Cranach the elder.

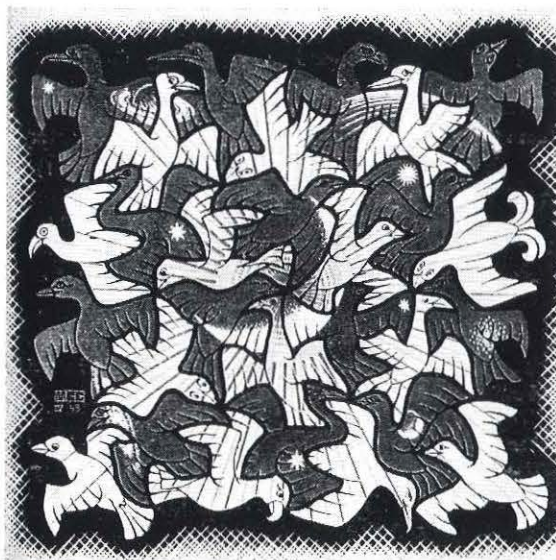


Fig. 6. Sun and Moon, M. C. Escher.

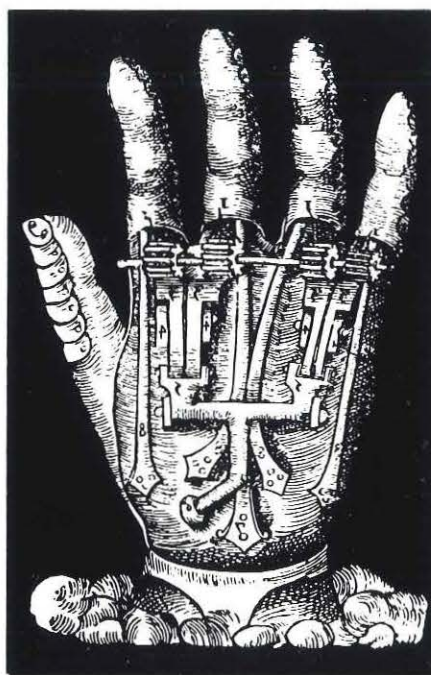


Fig. 7. Artificial hand. Engraving from the works of Ambroise Paré.

THE INJURED HAND

Goetz: My right hand, though not without use in war, is insensible to the pressures of friendship; it is of one kind with its gauntlet—you see it is of iron.

Goethe.

The hand, das aussere Gehirn (The external brain) of Kant, and the organ of organs of Aristotle, has received praise enough in its time.

Leonardo da Vinci, that many-sided genius, was fascinated by it and enriched our culture with a series of splendid drawings of the hand. One might expect physicians to be inspired by it too. However, as elsewhere in history of medicine, it was the demand that stimulated the supply—a demand moreover that came from a group of men who both literally and figuratively had lost the power to take things in their own hands. First of all the knights who had lost a hand on the field of battle. Faced with the loss of an organ which was so important, especially for him, he had to make do with a copy, a prosthesis, in an age when replantation had not yet been heard of.

Goetz von Berlichingen lost his arm at Landshut in 1504, and asked the town's smith to make him a new one. Another artificial arm, designed by Ambroise Paré in the same century, is as well known as the famous surgeon himself (Fig. 7).

Nearly three centuries later an Englishman who had lost the use of his hand offered a prize of 30,000 francs for the best work on this organ. Charles Bell was stimulated by this to write "The hand, its mechanism and vital endowment as evincing design". This book did not receive the attention it deserved, and in his book on the Physiology of Motion Duchenne de Boulogne asks himself why. Time seems to be standing still. This is the century of observation.

Dupuytren describes the contracture which bears his name. Stasis is insight, insight is progress. The act follows the thought like a shadow. Antisepsis makes it possible to operate on the hand. Industrialisation as a result of which the hand is injured by its projection the machine, makes it necessary. What is still lacking is knowledge, based on experience and investigation. In 1939 Kanavel showed us how to treat infections of the hand, and the war that followed formed a school in which a number of surgeons who were to achieve world fame learned their art. Bunnell in America, MacIndoe in Great Britain, Hilgenfeldt in Germany. Together with Iselin in France, who had earlier received the charge from his teacher to occupy himself with "La petite chirurgie", they performed pioneering work. They collected knowledge and passed it on.

In his book "Denken met de handen" (Thinking with the hand; in Dutch), Denis de Rougemont deals with the conflict between brains without hands, which only form opinions, and hands without brains, which have no opinions. According to this philosophy, thought without action is fruitless; hence the title of his book. It follows that thinking about the hand should be done with the hand too.

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